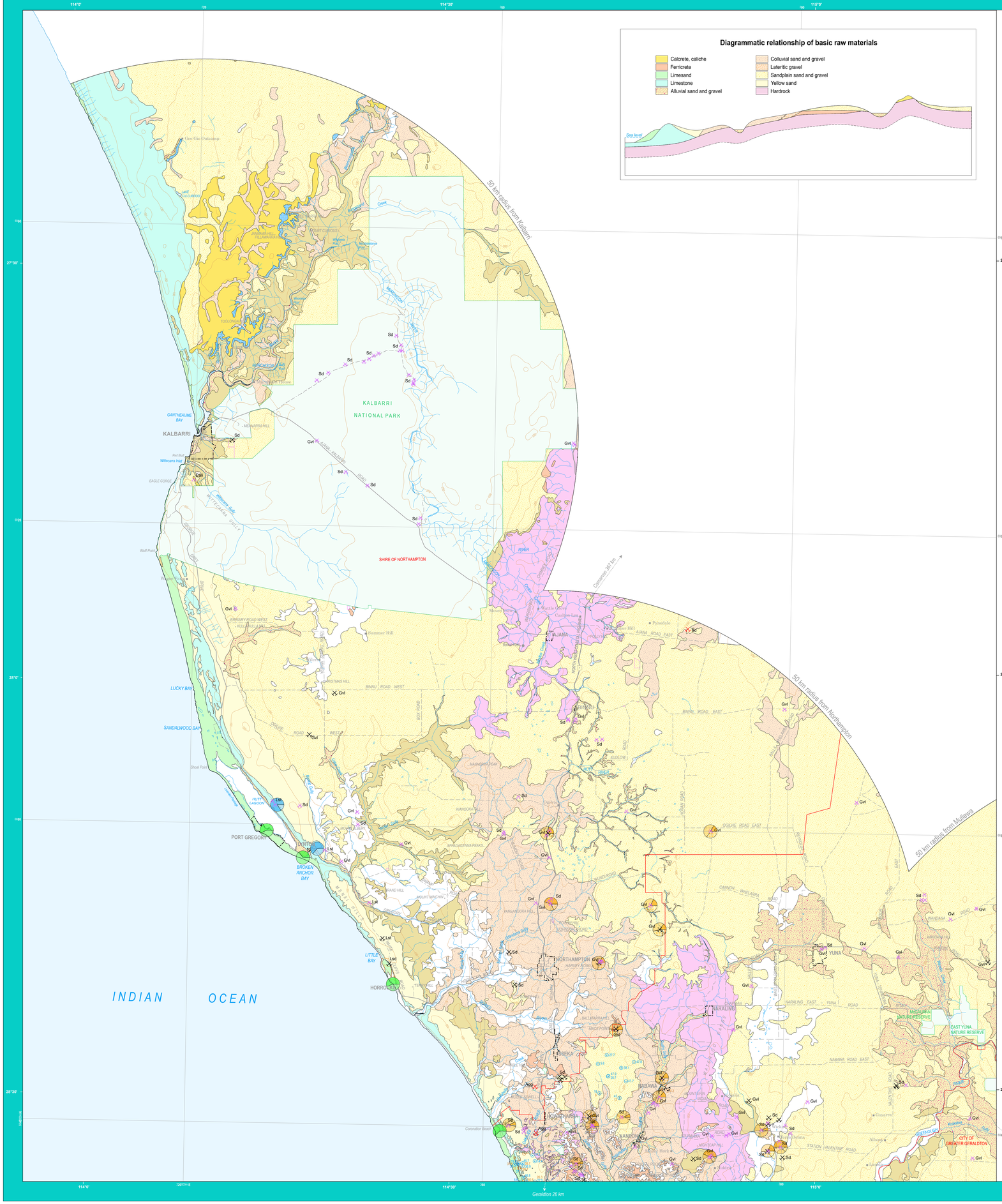


Diagrammatic relationship of basic raw materials

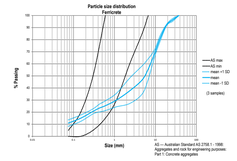
Surficial materials

Calcrete, caliche

Calcrete is extensively developed as a duricrust on calcilutite bedrock northeast of *Kalbarri*. The calcrete is massive to lumpy or nodular and is estimated to be generally less than 10 m thick. One inactive gravel pit is located in this material 6.5 km south of *Kalbarri*.

Ferricrete

Ferricrete is exposed south of *Northampton* and east and southeast of *Kalbarri* as small, widely scattered outcrops of residual, reddish brown, hard, rubbly, pisolitic or massive lateritic duricrust on hill crests and summit surfaces. It is generally up to 3 m thick. Three active and two inactive gravel pits are located south of *Northampton* and two inactive gravel pits are located 50 km east of *Kalbarri* in the *Kalbarri National Park*.



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Limesand

Series of parabolic and nested parabolic dunes composed of pale pinkish grey, fine- to medium-grained quartz sand and shell debris found along the coastline between *Bluff Point* and *Lynton* and south of *Oakabella Creek*. These dunes are generally stable with foredunes and frontal dunes susceptible to wave and wind erosion although areas of blowouts are evident. There is a single active quarry at *Horrocks*. For all deposits, the groundwater table is generally less than 10 m below the ground surface.

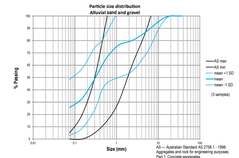
Limestone

Low hills and rises of deflated transgressive barrier and parabolic dunes, now lithified to limestone, extend in a broadly continuous belt parallel to, and immediately inland of, the coast. The limestone is a pale yellowish brown calcarenite and calcareous sandstone containing quartz and shell debris and is variably lithified. A relatively thin, strong calcrete caprock overlies the limestone. A single, active limestone quarry is located 15 km southeast of *Lynton*, while four inactive quarries are located in the *Port Gregory – Lynton* area.

Sand and gravel

Alluvial sand and gravel

Alluvial channels, plains, floodplains and river terraces are associated with the major rivers of the area — *Murchison* and *Chapman Rivers* and *Kockatea Gully* and their tributaries. The material on the plains and floodplains is dominantly a mixture of reddish brown firm to stiff, poorly sorted clay, silt, sand and gravel, some of which is partly calcreted or has hardsetting hardpans at moderate depth. The terraces are typically yellowish red silty sand, gravelly in parts, with grey clay layers. One small, active sand pit is located 17 km southeast of *Nabawa* in the upper reaches of a tributary of the *Chapman River*. Four inactive sand pits are associated with the *Chapman River* and its tributaries. Thicknesses of material are generally less than 2 m. Groundwater is generally close to the ground surface.



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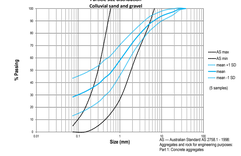
Colluvial sand and gravel

Colluvial material is present over much of the central southern parts of the area from north of *Northampton* to south of *Nanson* and as a discontinuous belt northeast of *Kalbarri*. South of *Howatharra* narrow, steep talus slopes lie below most of the summit surfaces and grade downslope into gently inclined footslopes. The material on these slopes is relatively thin, 1–2 m, and comprises strong brown, gravelly silty sands. Further north, residual, light brownish yellow, slightly gravelly, medium-grained quartz sand overlies weathered granites. Northeast of *Kalbarri* the material is a proximal deposit on moderately sloping valley flanks. The material on these slopes is relatively thin and comprises strong brown, gravelly silty sands, some of which are calcreted and variably lithified. Three active sand and gravel pits are known from north of *Northampton* south to *Nanson* and 20 inactive sand and gravel pits are known throughout the central south of the area.



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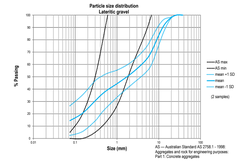
Lateritic gravel

Two very small, isolated deposits of lateritic gravel are located between three and six kilometres southeast of *Howatharra* as concentrations of loose, iron-rich nodules and pisoliths and fragments, commonly set in a clay-rich or sandy matrix on gently sloping colluvial hillslopes. The material on these slopes is relatively thin, 1–2 m. An inactive sand and gravel pit is located in the same area.



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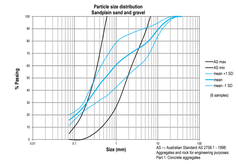
Sandplain sand and gravel

Sandplain sand and gravel covers 55% of the area and consists of level to gently undulating sandplain with few drainage lines. The materials of the sandplain comprise loose, pale yellowish brown, silty, quartz sands between 1–3 m in thickness overlying ferruginous, sandy lateritic gravel, which becomes cemented with depth. The gravel overlies weathered sandstone and siltstone bedrock. Eighteen active sand and gravel pits are located mainly in the central and southern parts of the area, while 62 inactive sand and gravel pits are located throughout the area.



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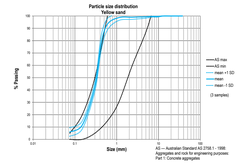
Yellow sand

Residual, pale yellowish brown, medium- to coarse-grained quartz sand is present along the coastal belt south of *Bluff Point*. The yellow sand is the weathering product, by surface leaching and groundwater precipitation, of the underlying limestone. This is the main source of both specification and non-specification sand in the area, but is of variable quality. The more silty red sands are preferred for building pads, and these are commonly located close to the limestone. Two inactive pits are located 4.5 km southwest of *Howatharra* with a further single inactive pit located 9 km north of *Lynton*.



A5 — Australian Standard AS 2758.1 - 1998: Aggregates and rock for engineering purposes Part 1: Concrete aggregates

DATA SOURCES

Theme	Data Currency	Organization[1]
Basic raw materials	2014	Geological Survey of Western Australia, Department of Mines and Petroleum
Topography	2013	Landgate / Geoscience Australia
Contours	2006	Geological Survey of Western Australia, Department of Mines and Petroleum
Mining tenements	2015	Mineral Titles Division, Department of Mines and Petroleum

[1] WA State Government unless otherwise indicated

Hard rocks

Sedimentary rocks

Calcilutite

Calcilutite is a white, weathering to greenish grey, very fine grained, hard limestone. It crops out northeast of *Kalbarri* in a narrow, discontinuous belt. Thicknesses of calcilutite from boreholes have been proved up to 26 m. This material has not been worked.

Sandstone

Thick sequences of variably red-mottled quartz and feldspathic sandstone, some thinly bedded and cross-bedded, are present along the entire length of the *Murchison River* gorge and its tributaries. The sandstone is known to be many hundreds of metres thick. Sandstone also crops out between 8 km and 35 km southeast of *Nabawa*, along the valley of the *Hutt River* and between *Horrocks* and *Northampton*. In these areas the sandstone crops out as variegated, fine- to coarse-grained, feldspathic sandstone with some siltstones and shales, overlain by residual, thin sandy silts and gravels in places. An active sand pit, obtaining material from the weathered sandstone, is located 8 km southeast of *Nanson*.

Sandstone and conglomerate

Thin, poorly sorted sandstone to conglomerate is exposed in two areas — 50 km northeast and 50 km east-southeast of *Kalbarri* — as small, isolated deposits. The material is extensively silcreted and has not been worked.

Igneous and metamorphic rocks

Granite

Granite includes a range of rocks: fine- to medium-grained granite, porphyritic granite, granulite and granite gneiss. They crop out in the central part of the area and in a north-trending belt in the central south of the area as low hills and domes with boulder strewn slopes and deeply dissected terrain. Granites are generally pink to grey, medium- to coarse-grained, equigranular rocks, although porphyritic, banded and other textures are common.

Quarries and pits

- Active
- Inactive
- Proposed

Agg Aggregate
Cali Calcrete, caliche
Gvl Gravel
Lsd Limesand
Lst Limestone
Sd Sand

Analyses

Limesand

$CaCO_3$ — Acid insoluble residue

Limestone

$CaCO_3$ — Acid insoluble residue

Sand and gravel

Sand — Fines — Gravel

Tenure for basic raw material

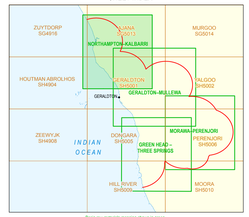
- Extractive industry licence, live (*Planning and Development Act 2005*)
- Crown reserve for basic raw materials

Boreholes

- Showing depth to the ground water, in metres
- Showing thickness of surficial material, in metres
- Aboriginal community
- Homestead
- Highway, with national route marker
- Major road
- Minor road
- Townsite (*Land Administration Act 1997*)
- Class A National Park or Nature Reserve
- Local Government Authority boundary
- Drainage
- Contour, elevation in metres

Basic raw materials on this map have been compiled from existing Geological Survey of Western Australia and Department of Agriculture and Food WA maps.
Uncoloured areas indicate undivided bedrock and surficial deposits not considered basic raw material resources.

SHEET INDEX



Basic raw materials mapping shown in green
Extent of project area shown in red
1:250 000 maps shown in brown

Compiled by Geological Survey of Western Australia 2015

Cartography by I Lesiak

Edited by F Eddison and K Greenberg

Published by the Geological Survey of Western Australia
This map is published in digital format (PDF) and is available online at <www.dmp.wa.gov.au/GSWApublications>.
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Website: www.dmp.wa.gov.au/gswa Email: geological.survey@dmp.wa.gov.au

The recommended reference for this map is:
Geological Survey of Western Australia 2015, Basic raw material resources, Northampton–Kalbarri (1:200 000 scale): Geological Survey of Western Australia, Resource Potential for Land Use Planning.

ROYALTIES FOR REGIONS

Government of **Western Australia**
Department of **Mines and Petroleum**

HON. BILL MARMION MLA
MINISTER FOR MINES AND PETROLEUM

Geological Survey of Western Australia

RICK ROGERSON
EXECUTIVE DIRECTOR

SCALE 1:200 000

0 5 10 15 20
Kilometres

UNIVERSAL TRANSVERSE MERCATOR PROJECTION
HORIZONTAL DATUM: GEODETIC DATUM OF AUSTRALIA 1994
VERTICAL DATUM: AUSTRALIAN HEIGHT DATUM

Grid lines indicate 40 000 metre interval of the Map Grid Australia Zone 50

GDA

The Map Grid Australia (MGA) is based on the Geocentric Datum of Australia 1994 (GDA94). GDA94 positions are compatible within one metre of the datum WGS84 positions

RESOURCE POTENTIAL FOR LAND USE PLANNING

Basic Raw Material Resources

NORTHAMPTON–KALBARRI

This mapping was produced to identify potential Basic Raw Material resources within close proximity of settlements between Green Head, Northampton and Morawa. The project received a funding contribution from the State Government of Western Australia through the Royalties for Regions Program.